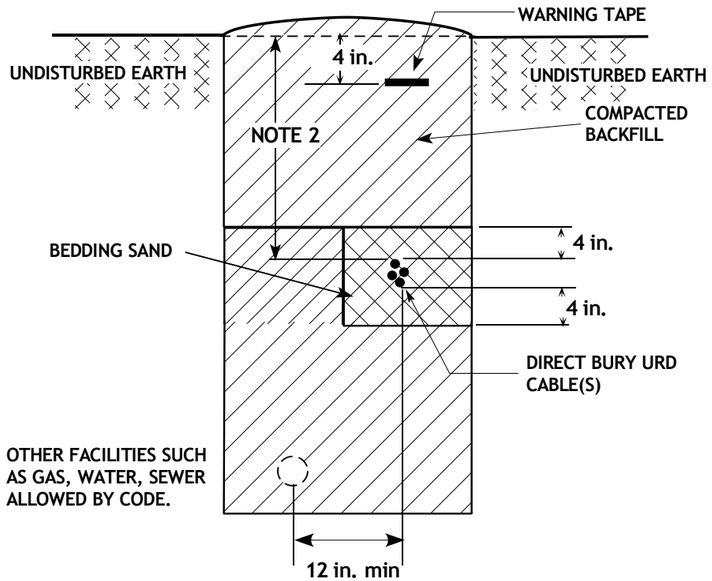
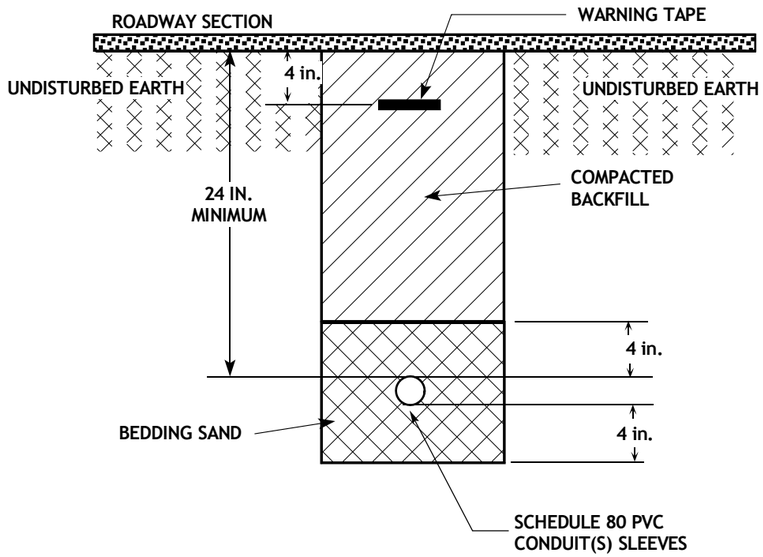


NOTES:

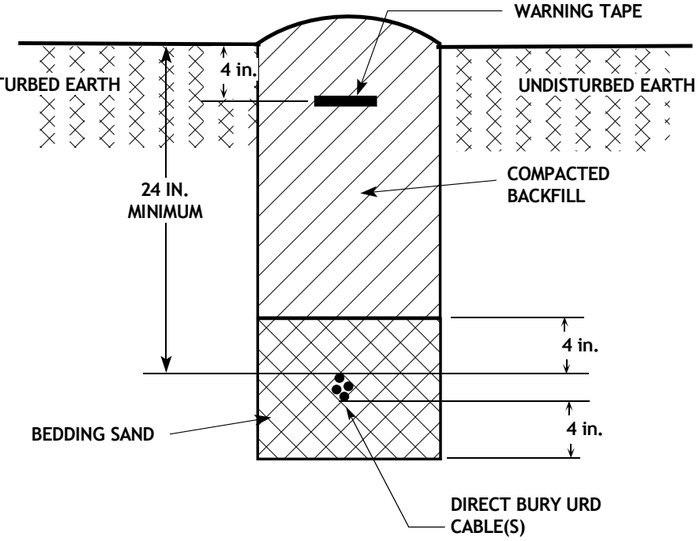
1. SINGLE CABLE SHOWN. MULTIPLE CABLES CAN BE USED.
2. BURIAL DEPTH 24 INCHES MINIMUM.
3. IF MORE THAN ONE CABLE OF THE SAME FACILITY IS INSTALLED IN A TRENCH, THE CABLES SHALL BE SEPARATED HORIZONTALLY BY 9 INCHES MINIMUM.
4. INSTALL CABLES 24 INCHES (UNLESS OTHERWISE NOTED) BELOW FOOTING FOUNDATION OR PAVEMENT BASE FILL.
5. CABLE OR CABLES SHALL NOT BE LOCATED ANY CLOSER THAN 3 INCHES FROM TRENCH SIDE WALL.
6. THE INCLUSION OF THIS DETAIL DOES NOT REQUIRE THE ELECTRICAL CONTRACTOR TO PROVIDE THE TRENCH. IT DOES REQUIRE THE ELECTRICAL CONTRACTOR TO SEE TO IT THAT THE TRENCHING, BEDDING, BACKFILL, ETC. ARE DONE IN ACCORDANCE WITH THESE REQUIREMENTS.

TRENCHING AND BEDDING DETAIL (JOINT USE)

NOT TO SCALE



SLEEVE UNDER ROADWAY



CABLE BURIAL OUTSIDE ROADWAY

NOTES:

1. SINGLE CONDUIT/SLEEVE OR CABLE SHOWN. MULTIPLE CONDUIT/SLEEVES OR DIRECT BURY URD QUADRAPLEX CABLES CAN BE USED.
2. IF MORE THAN ONE CONDUIT/SLEEVE OR QUADRAPLEX URD CABLE OF THE SAME FACILITY IS INSTALLED IN A TRENCH, THE CONDUIT/SLEEVE/CABLE SHALL BE SEPARATED HORIZONTALLY BY 6 INCHES MINIMUM.
3. INSTALL CONDUIT/SLEEVE 24 INCHES (UNLESS OTHERWISE NOTED) BELOW PAVEMENT BASE FILL.
4. CONDUIT/SLEEVE/CABLE SHALL NOT BE LOCATED ANY CLOSER THAN 3 INCHES FROM TRENCH SIDE WALL.
5. WHERE BURIAL DEPTH CANNOT BE ACHIEVED, USE CONDUIT AND/OR CONCRETE COVER TO REDUCE BURIAL DEPTH IN ACCORDANCE WITH THE NEC.
6. FOR TRENCHES NOT UNDERNEATH ROADWAY SECTION (ASPHALT PLUS SHOULDER), USE TOP SOIL FOR THE TOP 3 INCHES.

TRENCHING AND BEDDING DETAIL

NOT TO SCALE

TRENCHING DETAILS

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PROJECT: 15-07-16
DATE: JANUARY 2017

CONSULTING AND DESIGN
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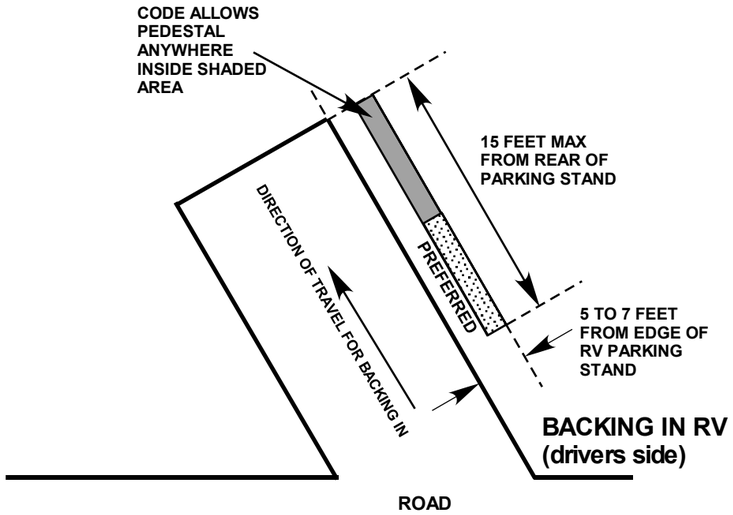
MONTANA STATE PARKS

FINLEY POINT STATE PARK CAMPGROUND
REGION 1 FWP #7096123

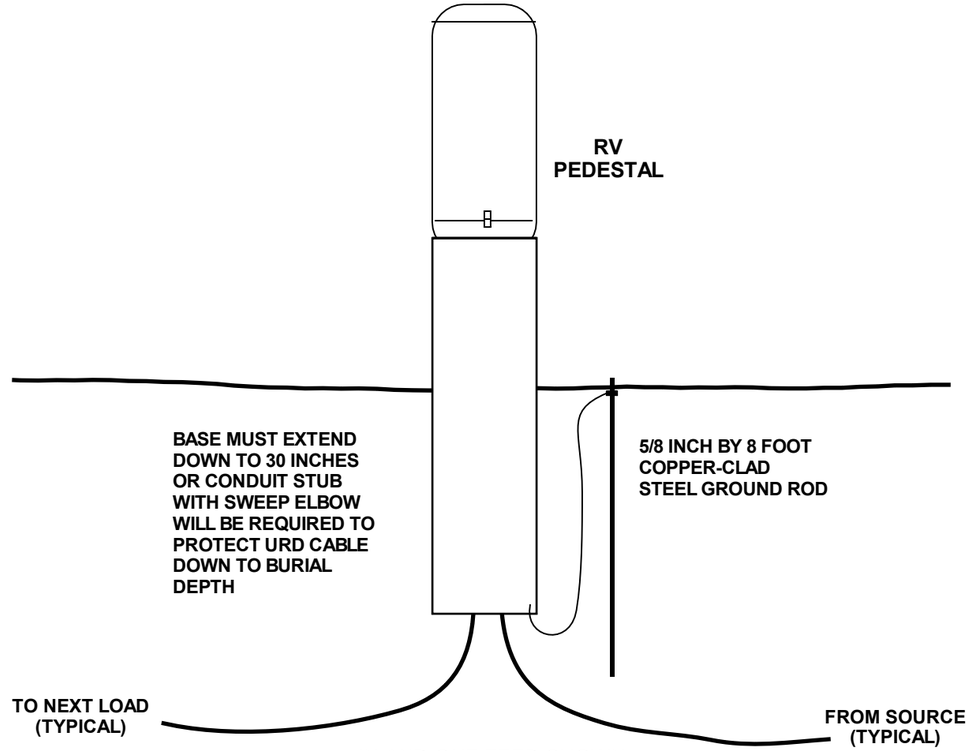
SHEET: E 3.0

041017



DETAIL - ELECTRICAL PEDESTAL AT RV PARKING SPACE

NOT TO SCALE



RV PEDESTAL

NOT TO SCALE

PEDESTAL DETAILS

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PROJECT: 15-07-16
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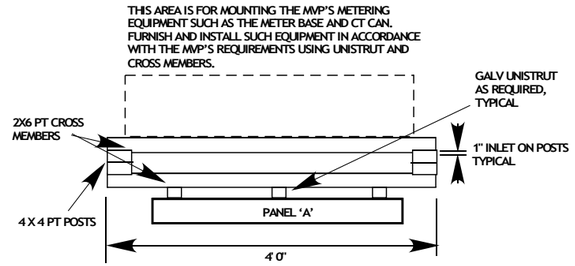
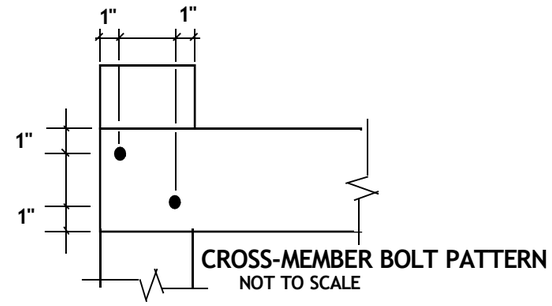
CHECKED BY: DATE:	APPROVED BY: DATE:	APPROVED BY: DATE:			

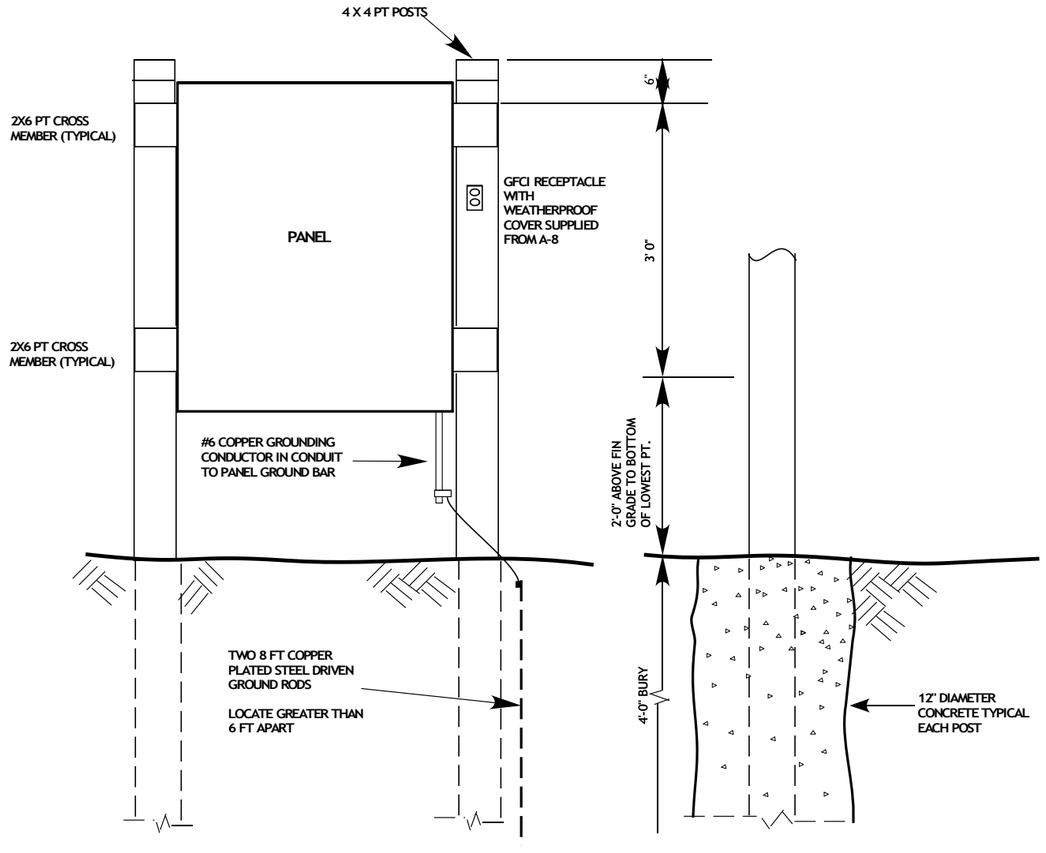
041017



PLAN VIEW



CROSS-MEMBER BOLT PATTERN
NOT TO SCALE



ELEVATION

FRAMING STRUCTURE:

1. STRUCTURE FOR RV SERVICE PANEL TO BE 4 X 4 ROUGH CUT PRESSURE TREATED POSTS, 4 FT IN GROUND. POSTS TO BE SET IN MINIMUM OF 12" DIAMETER CONCRETE FOR FULL DEPTH OF BURY.

2. PROVIDE 6 INCHES OF GRAVEL UNDERNEATH THE BOTTOM OF EACH POST TO REDUCE BOTTOM END ROT.

3. TOPS OF POSTS TO BE CUT WITH GABLE PITCH, MINIMUM OF 4/12.

4. ALL CUTS TO BE FIELD DRESSED WITH CCA TREATMENT.

5. CROSS MEMBERS TO BE 2 X 6 ROUGH CUT PRESSURE TREATED. CROSS MEMBERS TO BE INLET IN POSTS 1". SECURE TO POSTS WITH 5/8" GALV. MACHINE BOLTS ON FLAT WASHERS. BOLTS TO BE CONTINUOUS THROUGH BOTH CROSS MEMBERS AND POSTS. SEE PATTERNON DETAILS.

6. SECURE EQUIPMENT TO CROSS MEMBERS WITH GALVANIZED UNISTRUT AS REQUIRED. UNISTRUT TO BE THROUGH BOLTED TO CROSS MEMBERS , OR LAGGED THROUGH CROSS MEMBERS & INTO POSTS MIN 4" WITH 1/2" LAGS ON WASHERS.

7. ADJUST STRUCTURE DIMENSIONS TO FIT ACTUAL PANEL SIZE USED.

FRAMING DETAIL – PANEL STRUCTURES

NOT TO SCALE

ELECTRICAL DETAILS

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MONTANA STATE PARKS

FINLEY POINT STATE PARK CAMPGROUND
REGION 1 FWP #7096123

SHEET: E 3.2

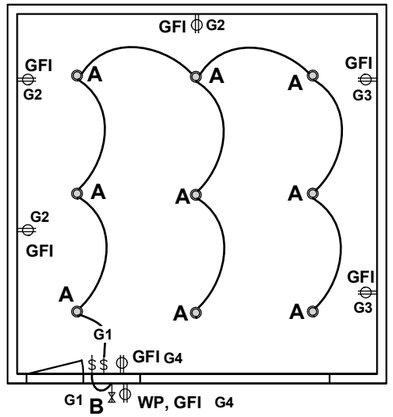
041017

ELECTRIC LEGEND

- WALL SWITCH SINGLE POLE
- CONVENIENCE OUTLET–DUPLEX
- CEILING FIXTURE
- EXTERIOR LIGHT
- WP — WEATHERPROOF DUPLEX

NOTES

1. ALL INTERIOR LIGHT FIXTURES TO BE MOUNTED IN THE CEILING USING METAL BOXES.
2. INTERIOR PLYWOOD SHEETING TO BE PAINTED WHITE.
3. RECEPTACLES MOUNTED AT 48 INCHES AFF.
4. ADD WELDER RECEPTACLE AT A LOCATION INDICATED BY THE OWNER. CIRCUIT G5.



ELECTRICAL PLAN
SCALE: 1/4" = 1'

MAINTENANCE SHED

FIXTURE 'A' AND 'B' CATALOG SHEETS ARE LOCATED ON E4.X IN THIS DRAWING PACKAGE.

PANEL 'MS'

MAIN: 100 AMP MAIN BREAKER
BUS: 100 AMPS MINIMUM

SQUARE D OR GE PANEL OR EQUIVALENT

LOAD	SLOT #	CKT.	SERVICE	AMPS	BRKR	WIRE	USE	PHS	USE	WIRE	BRKR	AMPS	SERVICE	CKT.	SLOT #	LOAD
400	1	G-1	LIGHTS	20	THQ	#12 NM	H,N,G	1	H,N,G	#12 NM	THQ	20	1/3 RECEPTACLES	G-2	2	250
250	3	G-3	1/3 RECEPTACLES	20	THQ	#12 NM	H,N,G	2	H,N,G	#12 NM	THQ	20	1/3 RECEPTACLES	G-4	4	250
2,500	5	G-5	WELDER	50	THQ	#6 MC	2H,N,G	1			THQ	20	INSTALL SPARE BREAKER		6	
2,500	7		WELDER	50	THQ			2			THQ	20	INSTALL SPARE BREAKER		8	
	9							1			THQ	20	INSTALL SPARE BREAKER		10	
	11							2			THQ	20	INSTALL SPARE BREAKER		12	

NOTES:
1. 2H,N,G MEANS RUN TWO HOT, ONE NEUTRAL AND ONE GROUND CONDUCTOR
2. CONDUCTOR SIZING BASED ON COPPER THWN CONDUCTORS.

VA	Ø	AMPS
3,150	1	26
3,000	2	25

MAINTENANCE SHED ELECTRICAL

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MONTANA STATE PARKS

FINLEY POINT STATE PARK CAMPGROUND
REGION 1 FWP #7096123

SHEET: E 3.3

041417

PANEL 'A'

MAIN: 600 AMP MAIN BREAKER — SQUARE D OR GE PANEL OR EQUIVALENT

BUS: 600 AMPS MINIMUM

LOAD	SLOT #	CKT.	SERVICE	AMPS	BRKR	WIRE	USE	PHS	USE	WIRE	BRKR	AMPS	SERVICE	CKT.	SLOT #	LOAD
14,400	**1**	A-1	PEDESTALS L1, 2, AND 3	125	THQ	CONDUCTOR 2	2H,N,G	**1**	H,N,G	CONDUCTOR 3	THQ	20	VAULT TOILET LIGHT	A-2	**2**	30
14,400	**3**		PEDESTALS L1, 2, AND 3	125	THQ			**2**	2H,N,G	CONDUCTOR 2	THQ	150	EXISTING OLD MAIN PANEL	A-4	**4**	14,400
14,400	**5**	A-5	PEDESTALS L4,5, & 6	125	THQ	CONDUCTOR 2	2H,N,G	**1**			THQ	150	EXISTING OLD MAIN PANEL		**6**	14,400
14,400	**7**		PEDESTALS L4,5, & 6	125	THQ			**2**	H,N,G	CONDUCTOR 3	THQ	20	RECEPTACLE ON STRUCTURE	A-8	**8**	100
9,600	**9**	A-9	EXISTING BOAT PEDESTALS	125	THQ	CONDUCTOR 2	2H,N,G	**1**			THQ	20	INSTALL BREAKER		**10**	
9,600	**11**		EXISTING BOAT PEDESTALS	125	THQ			**2**			THQ	20	INSTALL BREAKER		**12**	
	13							**1**			THQ	20	INSTALL BREAKER		**14**	
	15							**2**			THQ	20	INSTALL BREAKER		**16**	
	17							**1**			THQ	20	INSTALL BREAKER		**18**	
	19							**2**			THQ	20	INSTALL BREAKER		**20**	
	21							**1**							**22**	
	23							**2**							**24**	

NOTES:
1. 2H,N,G MEANS RUN TWO HOT, ONE NEUTRAL AND ONE GROUND CONDUCTOR
2. CONDUCTOR SIZING BASED ON COPPER THWN CONDUCTORS.

VA	Ø	AMPS
52,830	1	440
52,900	2	441

PANEL 'B'

MAIN: 600 AMP MAIN BREAKER — SQUARE D OR GE PANEL OR EQUIVALENT

BUS: 600 AMPS MINIMUM

LOAD	SLOT #	CKT.	SERVICE	AMPS	BRKR	WIRE	USE	PHS	USE	WIRE	BRKR	AMPS	SERVICE	CKT.	SLOT #	LOAD
14,400	**1**	B-1	PEDESTALS H2, 4, AND 6	125	THQ	CONDUCTOR 2	2H,N,G	**1**	H,N,G	CONDUCTOR 3	THQ	20	ENTRANCE STATION	B-2	**2**	750
14,400	**3**		PEDESTALS H2, 4, AND 6	125	THQ			**2**	2H,N,G	#2	THQ	100	MAINTENACE SHED	B-4	**4**	4,800
14,400	**5**	B-5	PEDESTALS H1, 3, & 5	125	THQ	CONDUCTOR 2	2H,N,G	**1**			THQ	100	MAINTENACE SHED		**6**	4,800
14,400	**7**		PEDESTALS H1, 3, & 5	125	THQ			**2**	H,N,G	CONDUCTOR 3	THQ	20	VAULT TOILET FIXTURE 'B'	B-8	**8**	30
14,400	**9**	B-9	PEDESTALS H7, 8, & 9	125	THQ	CONDUCTOR 2	2H,N,G	**1**	H,N,G	CONDUCTOR 3	THQ	20	VAULT TOILET FIX B & KIOSK 2 FIX C	B-10	**10**	85
14,400	**11**		PEDESTALS H7, 8, & 9	125	THQ			**2**			THQ	20	INSTALL BREAKER		**12**	
14,400	**13**	B-13	PEDESTALS H10, 11, & 12	125	THQ	CONDUCTOR 2	2H,N,G	**1**			THQ	20	INSTALL BREAKER		**14**	
14,400	**15**		PEDESTALS H10, 11, & 12	125	THQ			**2**			THQ	20	INSTALL BREAKER		**16**	
9,600	**17**	B-17	HOST SITE 1 AND 2	125	THQ	CONDUCTOR 2	2H,N,G	**1**			THQ	20	INSTALL BREAKER		**18**	
9,600	**19**		HOST SITE 1 AND 2	125	THQ			**2**			THQ	20	INSTALL BREAKER		**20**	
	21							**1**			THQ	20	INSTALL BREAKER		**22**	
	23							**2**							**24**	

NOTES:
1. 2H,N,G MEANS RUN TWO HOT, ONE NEUTRAL AND ONE GROUND CONDUCTOR
2. CONDUCTOR SIZING BASED ON COPPER THWN CONDUCTORS.

VA	Ø	AMPS
72,835	1	607
72,030	2	600

ELECTRICAL SCHEDULES

MONTANA — MICHAEL T. FUSSELL — 7982 E — REGISTERED PROFESSIONAL ENGINEER

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PROJECT: 15-07-16
DATE: JANUARY 2017

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MONTANA STATE PARKS

FINLEY POINT STATE PARK CAMPGROUND
REGION 1 — FWP #7096123

SHEET: E 3.4

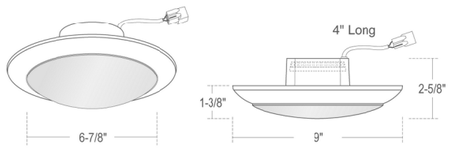
042417

TYPE PROJECT

CATALOG#

LCMLD9 - 9" SURFACE MOUNT LUMEN DISC

SURFACE MOUNT DOWNLIGHT



Available July 2016

SPECIFICATION

LED

Application: 9" General Purpose Surface Mount Downlight is perfect for Retrofit, New Construction and Remodel Applications in low to medium height ceilings. Adapter available for 120V medium base Housings.

Mounting: Universal mounting hardware allows mounting to all standard octagonal electrical junction boxes. Optional Recessed Housing Adapter available.

Lumen Maintenance: Minimum 50,000 hours L70 life based on ANSI TM-21 calculations from LM80 standardized test results.

Thermal Management: Effective thermal dissipation facilitated by integral cast-aluminum, finned heat sink design for maximum heat rejection to provide long LED life.

Driver: Electronic Direct Current driver mounted on fixture. Smoothly dims down to 5% with standard Low Voltage dimmers. Not recommended for 3-Way Dimmers.

Color Temperature: Comes standard with 3,000K Warm White or 4,000K Cool White LED's binned according to ANSI C78 377A for color temperature and chromaticity ranges.

Safety Labels: ETL/CETL listed. NYC approved: Calendar #41937.

Warranty: Covered by a 5 Year Warranty to be free of defects in materials and craftsmanship. Recommended for applications where ambient temperatures do not exceed 35°C, installations exceeding this temperature will result in reduced LED lamp life and a voided warranty.

Certification: This LED product is certified as compliant with California's Title 24 Energy Efficiency Standards by the California Energy Commission.

Wet Location: Suitable for Wet Location Installations.

Color Temp: Available in 3000K and 4000K.

LED Details:

16W 1300 Lumen Package
Color Rendering Index (CRI)[2]: 90
Color Temperature: 3,000K
Lamp Equivalent: 120W BR30

Benefit:

- Easily mounts to standard octagonal junction box.
- Removable translucent lens for easy cleaning.
- 120V-277V Standard
- Dims down to 5% with Triac Dimmers
- 1,300 Delivered Lumens (3,000K) (80 lm/w)
- 90+ CRI!

2016.8.22

FEATURE:

ORDERING EXAMPLE : LCMLD9UE-T40

LCMLD9	VOLTAGE	COLOR TEMP
LCMLD9	**UE** :120V/277V	**-T30** :3000K
		-T40 :4000K

ID#: 2971

ENERGY STAR PARTNER

Tel: 323.904.0200 Product specifications subject to change without notice. www.liton.com

A DIVISION OF EERMA LIGHTING GROUP

FIXTURE 'A'

CATALOG SHEETS

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MONTANA STATE PARKS

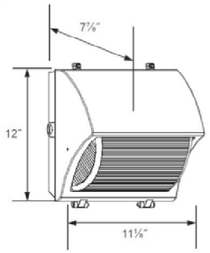
FINLEY POINT STATE PARK CAMPGROUND
REGION 1 FWP #7096123

SHEET: E 4.0

041017

DATE	
PROJECT	
TYPE	
NOTE	
PREPARED BY	

SM-CLW-307WP — Curved semi cut off LED wallpack



Small curved semi cut off LED wall pack fixture, suitable for wet locations, Perfect for lighting up residential exteriors, walkways, entry ways, perimeters, parking garages, school campuses, industrial/commercial spaces. This fixture has a wide rectangular light distribution. Comes with a 5 year/50,000 hour limited warranty.

FEATURES

- Energy Savings: Over 66% compared to HID light sources
- Improved lumen maintenance
- Utilizes high efficient Phillips Lumiled LED's
- Operating temperatures: -30°C ~ 60°C
- Driver: Constant current, 120-277v, 50/60Hz, 480v (Optional)
- Suitable for wet locations
- Dimming, occupancy sensors, photo cell capable (optional)
- Operating Life: >60,000 hours

CONSTRUCTION

- Housing is heavy-duty die-cast aluminum
- 1/2" Coin plugs with O-rings for conduit, sensors or photo cell
- Powder coat **bronze finish (standard)** various colors available (custom).
- Prismatic borosilicate glass lens
- Silicone gasket to prevent leakage and provide weather-tight protection.
- Mounting: Cast-in Template for Mounting Directly Over a 4" Recessed Outlet Box or use ½" Surface Conduit

OPTIONS

- (OCC) Motion sensor
- (PC) Button photo cell
- (EMR) Emergency battery backup
- (WG) Wire guard stainless steel
- (WC) Wireless controls

NEMA — Wireless Controls Available — Buy American Compliant — PHILIPS LUMILEDS

Model Number	INPUT POWER	LUMEN OUTPUT	SCOPTIC	COLOR TEMP (CCT)	CRI	RATED LIFE (L70)	INPUT VOLTAGE	INPUT FREQUENCY	HID Equivalent
C SM-CLW-307WP-5CLED	7W	757	1,211	5000K	70+	>200,000	120-277V	50/60HZ	35w HPS
B SM-CLW-307WP-10CLED	12W	1,376	2,201	5000K	70+	>200,000	120-277V	50/60HZ	50w HPS
SM-CLW-307WP-15CLED	20W	1,918	3,068	5000K	70+	>200,000	120-277V	50/60HZ	70w HPS
SM-CLW-307WP-21CLED	25W	3,102	4,963	5000K	70+	>200,000	120-277V	50/60HZ	100w HPS
SM-CLW-307WP-40CLED	45W	5,504	8,806	5000K	70+	>200,000	120-277V	50/60HZ	150w HPS

Ordering Guide Example: (SM-CLW-307WP-40CLED-50-MV-BZ-MS)

SM-CLW-307WP					
MODEL	WATTS	COLOR TEMP	VOLTAGE	FINISH	OPTIONS
SM-CLW-307WP	5W-5CLED 10W-10CLED 15W-15CLED 21W-21CLED 40W-40CLED	27-2700K 30-3000K 35-3500K 40-4000K 50-5000K 57-5700K 65-6500K	MV=120-277V 480-480V	BZ– BRONZE GRY-GRAY BLK-BLACK WH– WHITE CUS-CUSTOM	OCC– MOTION SENSOR PC– BUTTON PHOTOCELL EMR– EMR BATTERY WG– WIRE GUARD WC– WIRELESS CONTROL

'B' ONLY

Crystal Lighting Corporation - 13182 Flores St., Santa Fe Springs, Ca. 90670
Phone: 562-944-0223 - Fax: 562-944-0225 - WEB: www.crystallighting.us

Crystal Lighting is BUY AMERICAN compliant - All products are proudly manufactured and/or assembled in the USA

FOR THE INFORMATION KIOSK, USE A SINGLE PHOTO CELL MOUNTED ON THE EXTERIOR OF THE BEAM TO CONTROL THE TWO FIXTURE 'C'.

FIXTURE 'B' & 'C' — **OUTSIDE FIXTURE FOR VAULT TOILETS, MAINTENANCE SHED, AND INFORMATION KIOSK.**

CATALOG SHEETS

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DATE: JANUARY 2017

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FUSSELL ENGINEERING
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CHECKED BY:	DATE:	APPROVED BY:	DATE:	APPROVED BY:	DATE:

MONTANA STATE PARKS

FINLEY POINT STATE PARK CAMPGROUND
REGION 1 — FWP #7096123

SHEET: E 4.1

041017

Quazite®

"PC" Style (Stackable) Service Box Assemblies

6" x 8"
11" x 18"
12" x 12"

ADJUST SIZE AS REQUIRED

For use as a **Splice Box, Pull Box, Equipment Enclosure, Meter Box, Valve Box,** or any application requiring easy access to an underground service.

BOXES ARE STACKABLE FOR EXTRA DEPTH

BOX WITH COVER

Standard color is gray-other colors available

- Lightweight, easy to handle for lower installed cost
- High strength
- Light and heavy duty designs available
- Exceptional resistance to sunlight exposure, weathering and chemicals-unaffected by freeze/thaw cycles
- Straight sides permit easy adjustment of box to grade
- Fits flush with sidewalk or grass area
- No grounding required
- Stainless steel inserts and bolts
- Skid resistant covers
- Optional colors available

Applications

Standard Cover

Design Load: **8000#** overa 10" square with a minimum test load of **12,000#**.

Design is for sidewalk applications with a safety factor for occasional non-deliberate light vehicular traffic.

Heavy Duty Covers

Design Load: **15,000#** over a 10" square with a minimum test load of **22,568#**.

Design is for driveways, parking lots and off roadway applications where subject to occasional non-deliberate heavy vehicles. (See Quazite® Instruction Sheet 102.)

Due to the variation in installations, and applications, this information should be used as a basis for recommendation and not a guarantee of performance.

Standard Cover Logos SELECT LID ID AS NECESSARY

09	Blank	26	High Voltage
10	C.A.T.V.	10	Irrigation
12	Communications	29	Lighting
14	Controls	32	Non-potable water
17	Electric	41	Street Lighting
21	Fiber Optics	43	Telephone
23	Gas	44	Traffic
24	Ground	46	Traffic Signal
		50	Water

IN THE GROUND JUNCTION BOX

CATALOG SHEETS

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CONSULTING AND DESIGN
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PROJECT: 15-07-16
DATE: JANUARY 2017

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BASIC ELECTRICAL REQUIREMENTS

1.1 GENERAL
A. The intent of the drawings is to indicate the general extent of work required for the project. The drawings for electrical work are diagrammatic, showing the location, type devices and equipment required. the drawings shall not be scaled for exact measurements. Provide all fixtures, lamps, devices, accessories, offsets and materials necessary to facilitate the system's functioning as indicated by the design and the equipment indicated.

1.2 ELECTRICAL INSTALLATIONS
A. Coordinate electrical equipment and materials installation with other building components.
B. Verify all dimensions by field measurements.
C. Arrange for chases, slots, and openings in other building components to allow for electrical installations.
D. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
E. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
F. Where mounting heights are not detailed or dimensioned, install electrical services and overhead equipment to provide the maximum headroom possible.
G. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide connection for each service.
H. All holes or passages through fire rated walls, fire stops, and other fire rated spaces resulting from electrical work must be sealed by the appropriate means to maintain the original fire rating of the wall, fire stop, or fire rated space.

1.3 NAMEPLATE DATA
A. Provide permanent operational data nameplate on each item of power operated equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage and handling.
B. Store equipment and materials at the site, Protect stored equipment and materials from damage.

1.5 ENVIRONMENTAL PROTECTION
A. The contractor shall not release any hazardous materials to the environment during the course of this work. If materials are encountered during demolition which are suspected to be hazardous, the contractor shall cease work and inform the Engineer for action by the Owner. If the contractor disturbs hazardous materials without consultation with the Engineer, abatement, mitigation, and restoration of the environment shall be the contractor's responsibility.
B. The contractor shall, in general, take all reasonable precautions and measures during the course of this work to protect and safeguard the natural and human environment. This shall be interpreted as a primary, rather than subordinate, requirement of the project.

1.6 CLEANING
A. Clean all light fixtures, lamps and lenses prior to final acceptance. Replace all inoperative lamps.
B. Clean up all waste or trash from the electrical work.

CODES AND STANDARDS

1.1 CODES AND STANDARDS
A. Comply with these specifications, project drawings, and all applicable local, State, and National laws, codes, standards, and regulations. In the event of differing requirements, the most stringent applies. Applicable portions of the following shall apply:
1. Building, other structures, and all facilities or systems with electrical installations within the scope of the National Electrical Code (NEC) published by the National Fire Protection Association (NFPA 70).
B. INSPECTIONS AND FEES
1. Inspection and approval by the State or local Electrical Inspector will be required prior to acceptance by the Owner.
2. The contractor is responsible for obtaining and paying for all necessary State or local permits and inspections.

1.2 SPECIAL REQUIREMENTS
The following are special requirements which may be more restrictive than the code:
1. Hot wires, neutral and ground wires are the same size unless otherwise indicated.
2. A ground wire must be pulled in all raceways regardless of raceway construction. Raceways shall not be used as the only ground conductor.
3. Switch leads must be the same size as branch circuit conductors. Therefore #14 switch lead is not allowed on a #12 circuit.
4. All connections must be torqued to specifications using a torque wrench.
5. The neutral connection lugs of a duplex outlet shall not be used for connecting the in and out neutral conductors. Generally a pigtail will be required.
6. A ground wire must be installed for each circuit. A common ground wire for several circuits, even if located in the same conduit, is not allowed.
7. All connections to devices such as receptacles and switches shall be made using the device lug screw. Push-in connections shall not be used.

ELECTRICAL SYSTEM

1.1 QUALITY ASSURANCE
A. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical work similar to that required for this project.
B. UL Standards:
1. Comply with applicable requirements of U.L. safety standards pertaining to electrical systems. Provide electrical equipment, products, and components which have been UL-listed and labeled.
2. Comply with UL Standard 486A, "Wire Connectors and Soldering lugs for Use With Copper Conductors" including, but not limited to, tightening of electrical connectors to torque values indicated.
3. Comply with applicable requirements of UL Standards Nos.467 and 869 pertaining to electrical grounding and bonding.
4. NEC Compliance: Comply with applicable requirements of NEC (NFPA 70) pertaining to construction and installation of electrical systems.
C. ANSI Compliance: Comply with applicable requirements of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical electrical systems and equipment.

2.1 METAL CONDUIT AND TUBING
A. General: Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thickness) for each service indicated.
1. Where types and grades are not indicated, provide proper selection determined by installer to fulfill wiring requirements, and comply with applicable portions of NEC for raceways.
B. Flexible Metal Conduit: FS EE-C-566 and UL 1. Formed from continuous length of spirally wound, interlocked zinc-coated strip steel.
C. Flexible Metal conduit Fittings: Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type.
D. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G.
1. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or non-insulated throat.
E. Electrical Metallic Tubing (EMT): FS WW-C-563, ANSI C80.3 and UL 797.
F. EMT Fittings: Use Type 1 fittings for rain tight connections. Use Type 2 fittings for concrete tight connections. Use Type 3 fittings for miscellaneous connections.

2.2 NONMETALLIC CONDUIT
A. Electrical Plastic Conduit: Schedule 40 or 80 as indicated on the drawings, UL-rated, construct of polyvinyl chloride compound C-200 PVC, and UL-listed in accordance with NEC Article 347 for direct burial, or above ground use.
B. PVC Conduit and Tubing Fittings: NEMA TC 3, mate and match to conduit and tubing type material.

2.3 CONDUIT BODIES
A. Provide galvanized cast-metal conduit bodies of types, shapes and sizes as required to fulfill job requirements and NEC requirements.

2.4 CONNECTION MATERIALS AND COMPONENTS
A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wirenuts, and other items and accessories as needed to complete splices and terminations of types indicated.

2.5 WIRES, CABLES, AND CONNECTORS
A. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and ratings, of wires/cables which are supplying electrical power. Reduced size ground conductors are not allowed unless expressly permitted on the drawings or in the specification.
1. Provide copper conductors with conductivity of not less than 98 percent at 20ºC (68ºF).
2. Conductors shall be copper THWN, THHN, OR XHHW unless otherwise indicated.

2.6 OUTLET BOXES AND COVERS
A. UL 514, cadmium— or zinc-coated if of ferrous metal.

SPECIFICATIONS

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SHEET: E 5.0

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2.7 DEVICE PLATES
A. Provide UL listed, one-piece device plates for outlets and fittings to suit the devices installed.
B. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel or cast metal having round or beveled edges.
C. Plates on finished walls shall be nylon or equivalent, minimum 0.10-inch wall thickness.
D. Plates shall be the same color as the receptacle or toggle switch with which it is mounted.
E. Plates installed in wet locations shall be gasketed.

2.8 SWITCHES
A. Toggle Switches: totally enclosed with bodies of thermosetting plastic and a mounting strap.
1 Handles shall be ivory.
2. Wiring terminals shall be of the screw type, side wired.
3. Switches shall be rated quiet-type AC only, 120/277 volts, 20 amp contact rating.
B. Disconnect Switches: Switches serving as motor-disconnect means shall be horsepower rated.
1. Provide heavy duty type switches where indicated, where switches are rated higher than 240 volts, and for double throw switches.
2. Fused switches shall utilize Class J fuse holders and fuses, unless indicated otherwise.
C. Mounting Height: shall be as indicated on the drawings.

2.9 RECEPTACLES:
A. General: NEMA 5-20R, specification grade, grounding type.
1. Bodies shall be ivory thermosetting plastic supported by a metal mounting strap.
2. Connect grounding pole to the mounting strap.
B. Weatherproof Receptacles: Provide in a cast metal box with a gasketed, weatherproof, cover plate and a gasketed cap over each receptacle opening. Receptacle cover shall provide weather protection even with a plug inserted into the receptacle body as required by recent UL changes.
C. Ground Fault Circuit Interrupter Receptacles: UL 943, and shall be duplex type for mounting in a standard outlet box. The device shall be capable of detecting a current leak of 5 milliamperes. The device shall be NEMA 5-20R.
D. Mounting Height shall be as indicated on the drawings.

2.10 PANELBOARDS AND LOAD CENTERS
A. General:
1. UL 67 and UL 50.
2. Panelboards for use as service disconnecting means shall additionally conform to UL 869.
3. Panelboards shall be circuit breaker equipped unless indicated otherwise.
4. Design shall be such that any individual breaker can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as a means of obtaining clearances as required by UL.
5. Where "space only" is indicated, make provisions for the future installation of a breaker sized as indicated.
6. All panelboard locks included in the project shall be keyed alike.
7. Directories shall be typed to indicate load served by each circuit and mounted in a holder behind transparent protective covering.
B. Panelboard Buses:
1. Support bus bars on bases independent of the circuit breakers.
2. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping.
3. Provide an isolated neutral bus in each panel for connection of circuit neutral conductors.
4. Provide a separate ground bus marked with a green stripe along its front and bonded to the steel cabinet for connecting grounding conductors.
C. Circuit Breakers:
1. Federal Specification WC-375, ambient-compensated, thermal magnetic type with interrupting capacity of 10,000 amperes symmetrical minimum.
2. Breaker terminals shall be UL listed as suitable for the type of conductor provided
D. Multipole Breakers:
1. Provide common-trip type with a single operating handle.
2. Breaker design shall be such that an overload in one pole automatically causes all poles to open.
3. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.
E. Circuit Breaker with Ground-Fault Circuit Interrupter:
1. UL 1053 and NFPA 70.
2. Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect a current imbalance of approximately 5 milliamperes.
F. Fusible Switches for Panelboards:
1. NEMA KS1, hinged door type.
2. Switches serving as motor disconnect means shall be horsepower rated.

2.11 FUSES
A. Cartridge Fuses, Current-limiting Type: UL 198C, Class J for 0 to 600 amps and Class L for 601 to 6000 amps.

INSTALLATION

3.1 INSPECTION
A. Examine areas and conditions under which raceways are to be installed, and substrate which will support raceways. Notify the Owner in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION
A. General: Install raceways as indicated; in accordance with manufacturer's written installation instructions, and in compliance with NEC, and NECA's "Standards of Installation."
1. Install units plumb and level, and maintain manufacturer's recommended clearances.
B. Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.
C. Wiring Methods: shall be as indicated on the drawings or as required by NFPA 70 to be installed otherwise.

3.3 INSTALLATION OF CONDUITS
A. General: Installed concealed conduits in new construction work.
1. Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings and cabinets to provide electrical continuity and firm mechanical assembly.
B. Conduit Installation: Follow minimum requirements in other areas as follows:
1. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.
2. Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
3. Size conduits to meet NEC, except no conduit smaller than 3/4 inch shall penetrate concrete or masonry.
4. Fasten conduit terminations in sheet metal enclosures by 2 locknuts, and terminate with bushing. Install locknuts inside and outside enclosure.
5. Place conduits at 90 degrees to main reinforcing steel. Separate conduits by not less than diameter of largest conduit to ensure proper concrete bond.
6. All horizontal conduit runs to be under slab, not in slab.
C. Non-Metallic Conduit: Make solvent cemented joints in accordance with recommendation of manufacturer.

3.4 INSTALLATION OF ELECTRICAL CONNECTIONS
A. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams.
1. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.
C. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.
D. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated.
E. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors.
1. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings.
2. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's Standard 486A.

3.5 BOXES, OUTLETS, AND SUPPORTS
A. Provide boxes in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
1. Each box shall have the volume required by NFPA 70 for the number of conductors enclosed in the box.
2. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of the ceiling supports or make adequate provisions for distributing the load over the ceiling support members in an approved manner.

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3.6 MOUNTING HEIGHTS
A. General: Mount panelboards, circuit breakers, and disconnecting switches so the height of the operating handle at its highest position will not exceed 78 inches from the floor or grade.

3.7 SPLICES
A. Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller with an insulated pressure type connector. Make splices in conductors No. 8 AWG and larger with a solderless connector and cover with an insulation material equivalent to the conductor insulation.

3.8 INSTALLATION OF ELECTRICAL GROUNDING
A. General: Install electrical grounding systems where shown, in accordance with applicable portions of NEC, with NECA's "Standard of Installation," and in accordance with recognized industry practices to ensure that products comply with requirements and serve intended functions. Grounding includes but is not limited to:

GROUND ALL EQUIPMENT
GROUND TO GROUND ROD
GROUND TO BUILDING STRUCTURE
GROUND TO WATER PIPES
GROUND TO OTHER UTILITIES

B. Ground all exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in nonmetallic raceways, grounding conductor of nonmetallic sheathed cables, and neutral conductor of wiring systems.
C. Make ground connection to driven ground rods on the exterior of the building. Weld grounding conductors to underground grounding rods or electrodes or use ground clamps approved for underground connections.
D. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

3.9 GROUNDING CONDUCTOR
A. Provide an insulated, green-colored equipment ground consisting of the same size and type conductor as the circuit hot conductor for all feeder and branch circuits.
B. This conductor shall be separate from the electrical system neutral conductor.
C. Run a separate ground wire for each circuit even if several circuits share the same conduit or trench. In no case shall the ground conductor be used in common for several circuits.

3.10 TESTS
A. Carry out all normal testing and operational checks to assure a complete, safe, and reliable system
B. Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.
C. Circuit all branch circuits as shown, connect to phase and circuit number indicated. Circuit changes shall have prior approval of the Owner.
D. Correct any discrepancies found as a result of the above tests including replacement of conductors, splices, re-connecting loads, changing phases, installing additional ground rods, etc.

SUBMITTALS

4.1 General contractor is responsible to coordinate project requirements involving more than one trade, is responsible to coordinate between trades and equipment suppliers, is responsible for performance of subcontractors to verify that equipment delivered to the project site for installation is in compliance with project plans and specifications, and must verify that such equipment will properly interface with equipment specified by other trades for installation and use on the project.

4.2 For the purpose of meeting those responsibilities, General contractor:
A. shall review all submittals from sub contractors;
B. shall verify compliance of those submittals with project plans and specifications; and
C. shall verify coordination of equipment identified in those submittals with equipment and/or work of other trades
before forwarding submittals to project engineer for review. Evidence of the General contractor's review and verification of the above requirements will be provided with submittals forwarded for review.

CATALOG SHEET NOTES

5.1 GENERAL
Catalog sheets are included in this drawing set which show major material items required for the project.

Specific manufacturers have been identified, but equivalent material items are welcome, even for specialized applications.

5.2 APPROVALS
If material items other than those indicated are to be provided, prior approval from the Contracting Officer/Contract Administrator/Engineer is required. Requests for prior approval shall be made at least 10 days before bid opening.

Prior approval shall not be required for material items which a consensus of manufacturers would agree to be of equivalent quality and performance.

5.3 SUBSTITUTIONS
Material items that cannot have substitutions or equivalents will be so marked.

5.4 SUMMARY
Catalog sheets have been included so that the bidder can have a better understanding of the material item requirements. In no case shall the inclusion of catalog sheets be construed to prevent bidding equivalent material items.

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